WHAT IS CLAIMED IS:

1. An image processing method comprising:

a step of obtaining an image of a predetermined scale from an input image;

a step of extracting, from the obtained image, pixels in a window which corresponds to a position of an input pixel and has a predetermined size;

a step of generating substitute data used to substitute a value of the input pixel on the basis of the extracted pixels in the window;

a step of calculating a difference value between the substitute data and the input pixel value;

a step of comparing the difference value with a first threshold value; and

a step of substituting, when the difference value is less than the first threshold value, the input pixel value by the substitute data.

2. The method according to claim 1, wherein the step of generating the substitute data comprises:

a step of calculating an average value in the window;

a step of determining if the input pixel belongs to one of two regions;

a step of calculating representative values for respective determined regions; and

a step of calculating difference values between the average value in the window and two representative values, and the input pixel value, and

a smallest one of the three calculated difference values is selected as substitute data.

3. The method according to claim 1, wherein the step of generating the substitute data comprises:

a step of calculating an average value in the window;

a step of determining to which of two regions respective pixels in the window belong;

a step of calculating representative values for respective determined regions;

a step of calculating a difference between the two calculated region representative values; and

a step of comparing the difference between the two region representative values with a second threshold value,

when the difference between the two region representative values is not more than the second threshold value, the average value in the window is selected as substitute data.

4. The method according to claim 3, further comprising:

a step of calculating an average of the two region representative values;

a step of comparing the average of the two region representative values with the input pixel value; and

a step of selecting, when the input pixel value is less than the average of the two region representative values, a smaller one of the region representative values, and selecting, when the input pixel value is not less than the average of the two region representative values, a larger one of the region representative values, and

wherein when the difference between the two region representative values is larger than the second threshold value, the selected representative value is used as substitute data.

5. The method according to claim 1, wherein the step of generating the substitute data comprises:

a step of determining to which of two regions respective pixels in the window belong;

a step of calculating representative values for respective determined regions;

a step of generating a random number; and

a step of selecting one of the two region representative values based on the random number, and

the selected region representative value is selected as substitute data.

6. The method according to claim 2, wherein the step of determining to which of two regions respective

pixels in the window belong is implemented by comparison with the average value in the window.

7. The method according to claim 2, wherein the step of determining to which of two regions respective pixels in the window belong is implemented based on an order of pixel values in the window.

8. The method according to claim 2, wherein the step of determining to which of two regions respective pixels in the window belong is implemented by comparison with a median of a pixel range in the window.

9. The method according to claim 2, wherein the two representative values are average values in the regions.

10. The method according to claim 2, wherein the two representative values are a second smallest pixel and a second largest pixel in the window.

11. The method according to claim 5, wherein the step of generating the random number includes a step of generating the random number using an M-sequence pseudo random code generation circuit having a shift register.

12. The method according to claim 11, wherein the step of generating the random number includes a step of counting 0 and 1 runlengths output from the M-sequence pseudo random code generation circuit, substituting, when the count value reaches a predetermined value, a next value by a different value, and outputting the substituted value.

13. The method according to claim 1, wherein the step of generating the substitute data comprises:

a step of generating a random number; and

a step of selecting one of pixels in the window based on the random number, and

a value of the selected pixel is used as substitute data.

14. The method according to claim 13, wherein the step of generating the random number includes a step of generating the random number by extracting bits required for selection from a shift register output of an M-sequence pseudo random code generation circuit with a shift register having bits not less than the number of bits required for the selection.

15. The method according to claim 13, wherein the step of generating the random number includes a step of repetitively inverting/non-inverting a value generated based on a shift register output of an M-sequence pseudo random code generation circuit with a shift register having bits not less than the number of bits required for the selection as a pixel is input, and outputting the generated value.

16. The method according to claim 13, wherein the step of generating the random number includes a step of repetitively inverting/non-inverting a bit order of a value generated based on a shift register output of an M-sequence pseudo random code generation circuit with a

shift register having bits not less than the number of bits required for the selection as a pixel is input, and outputting the generated value.

17. An image processing method comprising:

a step of obtaining an image by converting an input image to a predetermined scale;

a step of extracting, from the obtained image, pixels in a window which corresponds to a position of an input pixel and has a predetermined size;

a step of generating a plurality of substitute data used to substitute a value of the input pixel on the basis of the extracted pixels in the window;

a step of categorizing the input pixel to one of a plurality of categories;

a step of selecting one of the plurality of substitute data in accordance with the category;

a step of calculating a difference value between the selected substitute data and the input pixel value;

a step of comparing the difference value with a first threshold value; and

a step of substituting, when the difference value is less than the first threshold value, the input pixel value by the selected substitute data.

18. The method according to claim 17, wherein the step of generating the plurality of substitute data includes the step of generating substitute data of any one of claims 2, 3, 5, and 13.

19. The method according to claim 17, wherein the step of generating the plurality of substitute data includes a plurality of steps each of which is equivalent to the step of generating substitute data of claim 3, and selects second threshold values from a plurality of threshold values that each value differs.

20. The method according to claim 17, further comprising a step of selecting the first threshold value in accordance with the category.

21. The method according to claim 18, wherein the step of generating the plurality of substitute data includes the step of generating substitute data of any one of claims 2, 3, 5, and 13.

22. The method according to claim 1, wherein the step of obtaining the image includes a step of obtaining a reduced image by reducing the input image to the predetermined scale.

23. The method according to claim 1, wherein the step of obtaining the image includes a step of obtaining a downsized image by downsizing the input image to the predetermined scale.

24. The method according to claim 23, wherein the downsized image is generated by a plurality of downsize processes.

25. The method according to claim 23, wherein the step of obtaining the image includes steps of segmenting the input image into blocks in accordance

with a predetermined downsize scale; extracting a block in correspondence with the position of the input pixel; determining a representative value from pixels in the extracted block; and generating a downsized image having the representative value as a pixel value.

26. The method according to claim 25, wherein the step of determining a representative value from pixels in the block includes a step of generating a random number, selecting a pixel in the block based on the random number, and determining a value of the selected pixel as the representative value.

27. The method according to claim 25, wherein the step of determining a representative value from pixels in the block includes a step of determining a mode value in the block, and determining the determined mode value as the representative value.

28. The method according to claim 25, wherein the step of determining a representative value from pixels in the block includes a step of determining a median of a pixel range in the block, and determining the determined median as the representative value.

29. The method according to claim 23, further comprising a step of applying a filter process to the input image, and

wherein the step of obtaining the image includes a step of obtaining a downsized image by downsizing the

input image, which has undergone the filter process, to the predetermined scale.

30. An image processing apparatus comprising:

means for obtaining an image of a predetermined scale from an input image;

means for extracting, from the obtained image, pixels in a window which corresponds to a position of an input pixel and has a predetermined size;

means for generating substitute data used to substitute a value of the input pixel on the basis of the extracted pixels in the window;

means for calculating a difference value between the substitute data and the input pixel value;

means for comparing the difference value with a first threshold value; and

means for, when the difference value is less than the first threshold value, substituting the input pixel value by the substitute data.

31. An image processing apparatus comprising:

means for obtaining an image by converting an input image to a predetermined scale;

means for extracting, from the obtained image, pixels in a window which corresponds to a position of an input pixel and has a predetermined size;

means for generating a plurality of substitute data used to substitute a value of the input pixel on the basis of the extracted pixels in the window;

means for categorizing the input pixel to one of a plurality of categories;

means for selecting one of the plurality of substitute data in accordance with the category;

means for calculating a difference value between the selected substitute data and the input pixel value;

means for comparing the difference value with a first threshold value; and

means for, when the difference value is less than the first threshold value, substituting the input pixel value by the selected substitute data.

32. A program for making a computer execute an image processing method of claim 1.

33. A program for making a computer execute an image processing method of claim 17.

34. A computer readable recording medium recording a program of claim 32.

35. A computer readable recording medium recording a program of claim 33.